

Expert System

Assessment

DP-1 Atlas

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Version Basic

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1. Introduction

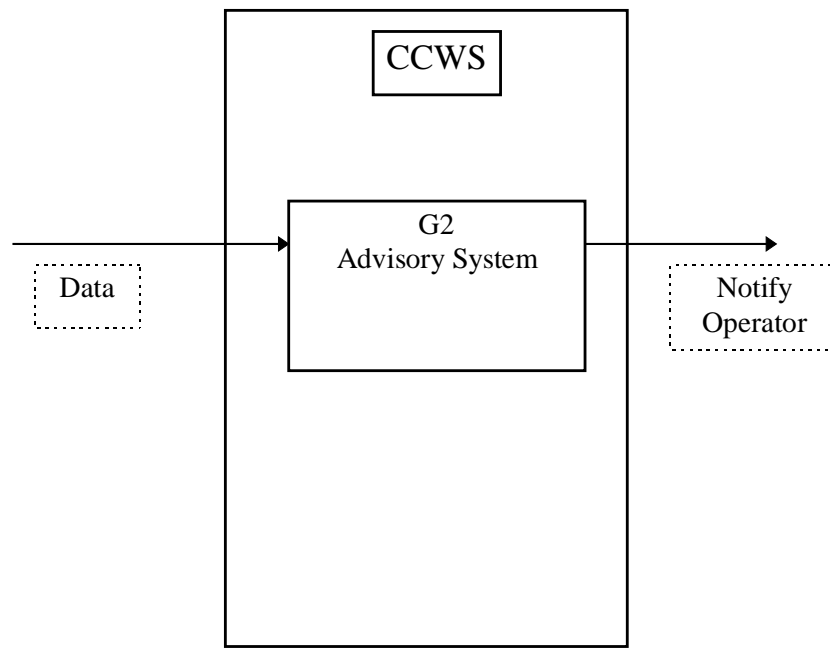
1.1 Expert System Overview.

The expert system thread is a pathfinder to assess expert system capabilities. Test applications will be built for the HMF for demonstration. These will be geared toward perceived opportunities for eventual deployment.

1.2 Expert System Concept

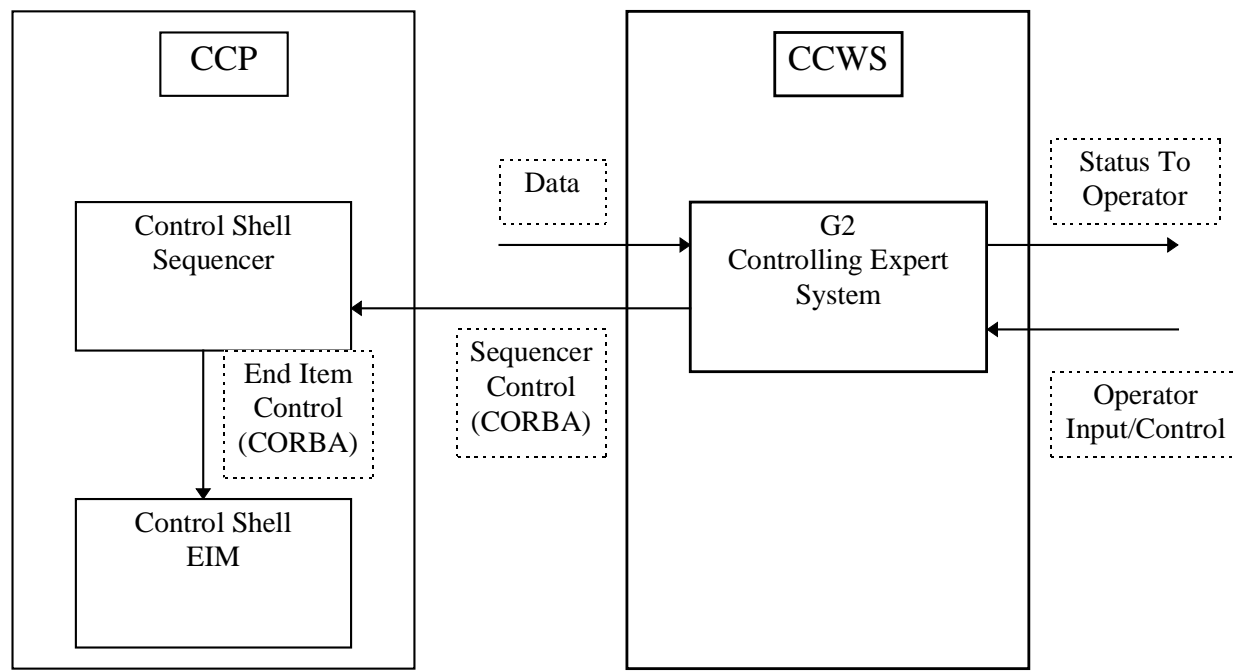
Advisory System:

Expert system software will run on the CCWS. It will be implemented in two stages / forms. The first is as an advisory system. In this stage, it will analyze data and advise the operator of things such as root cause of failures (such as breaker tripped or HIM card failure) or out-of-spec leak rates. This concept is shown below.



Controlling Expert System:

The second phase is for a controlling expert system. This might do such things as: given a goal / task by the operator, it “walks the maze” to determine the valves to cycle to achieve this goal. The path chosen is confirmed by the operator prior to G2 kicking off a ControlShell sequencer to execute the task. This functionality could also include baby-sitting type tasks. This concept is shown below.



(Note: This architecture assumes predefined tasks can be selected and/or that the ControlShell sequencer contains many “ifs”. This somewhat limits the complexity of the tasks, but putting G2 on the CCP was not seen as appropriate for a first phase expert system pathfinder).

1.3 Expert System Specification

1.3.1 Statement of Work

The expert systems pathfinder will explore the applicability of rule based programming to the tasks described below.

The HMF will be the target for this development. G2 will be used as the development tool.

For Atlas, an advisory system which does some or all of the following will be developed:

- Recognition and diagnosis of root causes of failures using a hierarchy tree. This implies recognition of failures such as a power bus failure when several measurements drop out.
- Test data analysis: interpret complex curves to determine such items as leak rates and regulator performance during testing.
- System integrity and leak detection: monitor the system while in a quiescent mode for the detection of out of spec leaks and other problems.

The following expert system items will be explored to determine feasibility:

- System baby-sitting with automatic securing / reconfiguration during operations such as purges and evacuation which require an engineer present currently “just in case” anything goes wrong such as a valve starting to leak. These operations may involve many possible configurations.
- “Walking the maze”: giving a “sequencer” an objective instead of a procedure. For example, an operator directs it to pressurize a particular part of the system. It determines which valves to cycle to accomplish that objective.

As with all exploratory efforts, various aspects of this effort may meet with different levels of success. The intent here is to explore capabilities and provide a demonstration, not to provide a “ready to use” product at the end of the Atlas delivery.

1.3.2 Requirements

SLS Section 2.2.5.1 Data Health

To provide a high level of data integrity, the CLCS will provide a Data Health function for Measurement FDs. Each Measurement FD will have a set of Health indicators which can be utilized by both user test applications and displays. These indicators are provided from System Applications, Advisory Systems and Users.

SLS Section 2.2.5.9 CLCS Advisory Expert System Applications will allow the user to create advisory applications to enhance the test engineers capability to detect faults and to predict future trends.

SLS Section 2.2.5.9.1 CLCS shall provide the capability to perform Advisory Expert System Applications.

SLS Section 2.2.5.9.1 RTPS Advisory Expert System Applications shall provide the capability to perform fault analysis.

SLS Section 2.2.5.9.1 RTPS Advisory Expert System Applications shall provide the capability to perform trend analysis.

1.4 Expert System Hardware Diagram

Not Applicable.

1.5 Expert System Deliverables

Prototype Demo only.

1.6 Expert System Assessment Summary

The Expert System Pathfinder is a standalone functionality and will not rely on any other CSCIs. Any interfaces for data, commanding, etc. will use existing APIs and CORBA interfaces.

1.6.1 Labor Assessments

The total Labor Costs required to provide this capability are summarized in the following table. Total labor costs are the two personnel assigned to this thread.

No.		Thor LM	Changes covered in
1	Expert System Thread	8.0 LM	
	TOTAL	8.0 LM	

1.6.2 Hardware Costs

There are no hardware costs associated with this thread.

1.6.3 Expert System Procurement

G2 licenses have already been procured. No other items are required.

1.7 Expert System Schedule & Dependencies

1.7.1 Schedule

Task Name	Start	Finish
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Task Name	Start	Finish
Atlas Assessment Kickoff		
Concept Panel Internal Review		3-26-98
Concept Panel		3-26-98
Advisory System Development		
Develop Informal Concept Requirements		5-15-98
Preliminary Design		6-15-98
First Prototype		7-15-98
Expert System Development		
Develop Informal Concept Requirements		7-01-98
Preliminary Design		8-01-98
First Prototype		9-25-98
Demonstration of Prototypes		9-25-98

1.7.2 Dependencies

HMF IPT - This thread will use EIM and Sequencer capabilities being developed as part of the HMF IPT.

1.8 Expert System Simulation Requirements

This pathfinder will use existing SGOS and/or Matrix X models.

1.9 Expert System Integration and System Test

No CIT testing will be performed. This software is demonstration only and is not used in support of any other capabilities.

1.10 Expert System Training Requirements

1.10.1 Training Needed

- 1) G2 part 1 training for one developer (completed 3-20-98)
- 2) G2 part 2 training for two developers (first scheduled 3-30-98, second TBD)

1.10.2 Training to be provided

None.

1.11 Expert System Facilities Requirements

None.

1.12 Travel Requirements

The following travel is necessary for G2 classes as noted above. Classes are not offered locally.

From	To	Reason	No. People	Duration
3-16-98	3-20-98	G2 Class (part 1)	1	5 day class
3-23-98	3-27-98	G2 Class (part 2)	1	5 day class
TBD	TBD	G2 Class (part 2)	1	5 day class

1.13 Expert System Action Items/Resolution

None.

2. CSCI Assessments

There are no CSCIs supporting this effort.

3. HWCI Assessments

There are no HWCIIs supporting this effort.

4. COTS Products Dependencies

4.1 SW Products Dependency List

All required licenses have been procured already (1 G2 development and 1 G2 run-time purchased; 1 existing G2 development relocated).

4.2 HW Products Dependency List

None.